

STUDIES ON THE MARYLAND FLORA VIII:

RANGE EXTENSIONS OF POLYGONUM PERFOLIATUM L.,

WITH NOTES ON INTRODUCTION AND DISPERSAL IN NORTH AMERICA

Richard E. Riefner, Jr.
20832 Skinner Lane
Huntington Beach, California 92646

Polygonum perfoliatum L., an herb native to eastern Asia, was reported for Maryland as locally established in Baltimore, Carroll and Harford Cos. by Reed (1979), and by Riefner and Windler (1979) from these counties with additional records from Cecil and Howard Cos., and Anne Arundel Co. by site report. The species, even at that time, was spreading rapidly and was becoming such a troublesome weed as to warrant note as a potential problem in the United States by Reed (1977). Without question, P. perfoliatum is the most important and noxious weedy species to invade the Central Atlantic States in recent decades. In southeastern Pennsylvania, and northeastern and central Maryland, the plant has spread so rapidly that within the span of a few years P. perfoliatum has become as common a weed as Japanese honeysuckle (Lonicera japonica L.). In Maryland, the species has extended its range to the west to Frederick Co., and as far south as Charles Co., to include eleven counties and Baltimore City. The plant has also reached northeastern Washington D.C. and will likely spread to the banks of the Potomac River, where dispersal into Virginia can be expected, perhaps within the next year. Since it is often difficult to establish the origins of and to trace the dispersal of exotic weeds, it seems appropriate to assemble the available data to provide as accurate as possible, historical documentation of the introduction and dispersal of P. perfoliatum in the Mid-Atlantic region before dispersal into the southeastern states ensues.

Polygonum perfoliatum is a glaucous, branching, vine-like perennial herb. Its slender flexuous stems, usually growing several meters in length, are found rambling, climbing, or more often, reclining on other plants. It grows from a base that may be herbaceous or one becoming woody with age. The angles of its stems, petioles, and the principle veins on the undersurface of its leaves are armed with recurved prickles. The distinctive leaves, usually 1-8 cm. in size, are deltoid, basally truncate, and peltate, with the apices and basal lobes acute to rather obtuse and about as long as wide. They are light green, often redish when young and usually minutely retorsely scabrous on the margins. Its petioles are divaricate and slightly longer than the blade. The ocrea are expanded into circular, amplexicaul, non-setose blades, 5-30 mm. in diameter, that are significantly

larger than the stem. Anthesis is brief and inconspicuous, and is first noted in June. The 3-3.5 mm. apetalous flowers are borne in axillary or terminal fascicles that are well concealed among upper leaves. The perianth is pale greenish-white to rarely pink, the segments broadly elliptic and baccate after anthesis. The spikes are 1-3 cm. long and are subtended by an orbicular bract much like the perfoliate ocrea. The fruits are subglobose, fleshy and berry-like, 4-6 mm. in diameter and metallic blue in color. The solitary achene is spherical, ca. 3.5 mm., and is lustrous black. The fruits are abundantly produced throughout the summer and fall until early November. Of our common eastern United States species, P. perfoliatum most closely resembles, and may be keyed to P. sagittatum L. and P. arifolium L., a comparative illustration has been provided by Riefner and Windler (1979). Glaucous stems and deltoid leaves, perfoliate ocrea, and peltate leaf attachment will distinguish P. perfoliatum from these taxa.

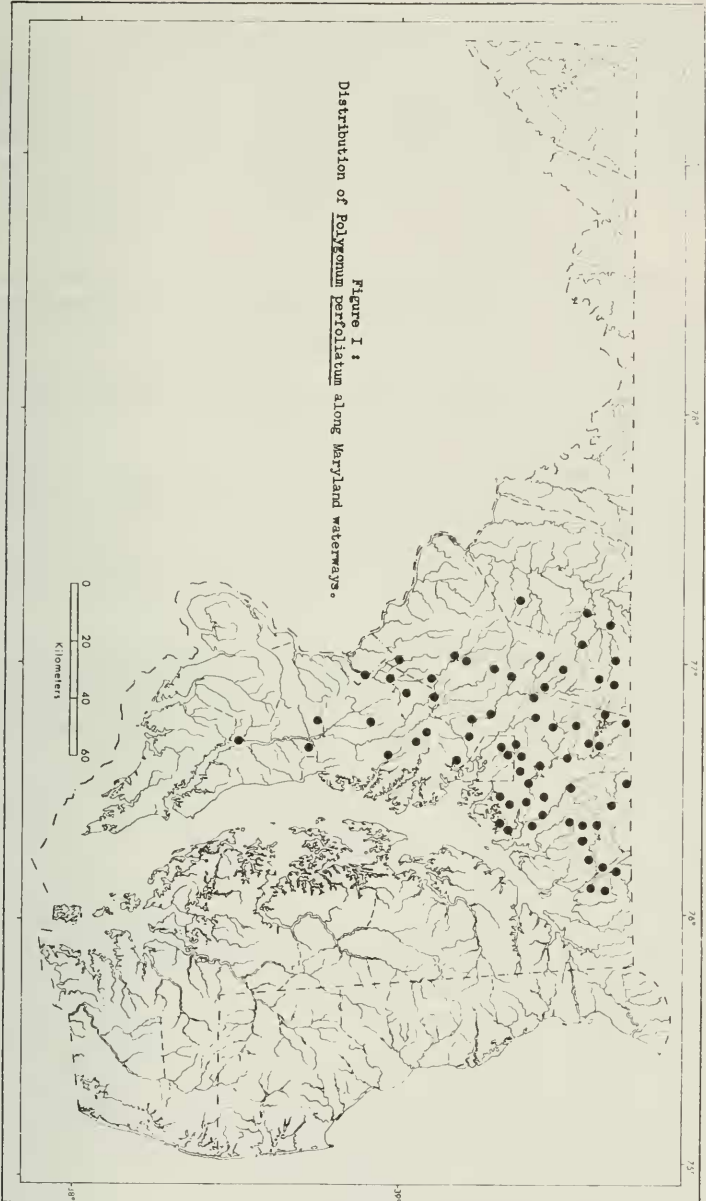
The first appearance of P. perfoliatum in the United States is recorded by a specimen collected from ballast in Portland, Oregon in the 1890's by Suksdorf 1607 (GH). This population was evidently short-lived in the Pacific States as shown by its absence from the treatments of the Polygonaceae by Abrams (1944), Hitchcock et al. (1964), and Munz (1968). According to Moul (1948), P. perfoliatum reappeared around the mid-1930's in a nursery owned by Mr. Joseph B. Gable at Stewartstown, York County, Pennsylvania. Apparently the species sprouted in an area planted with holly seed sent from Japan. The owner, interested in the beauty of the plant, allowed it to reproduce. However, the plant soon became a pest and efforts to eradicate it failed; subsequently, the plant spread to neighboring farms. Moul also states that in 1937, Dr. Joseph Ewan of the U.S.D.A., reported P. perfoliatum from the Glenn Dale Introduction Garden in Beltsville, Maryland, from a site planted with Meliosa seed from China. This population, however, was eradicated by the usual weeding of the gardens. Reed (1979) speculates that the plant was spread with Rhododendron to the Gable Nursery from the Glenn Dale infestation. The plant was also reported by Hickman and Hickman (1978) as established on the campus of Swarthmore College in southeastern Pennsylvania. Since populations they observed were somewhat associated with Rhododendron, they suggested that the plant was being spread by fragments attached to Rhododendron purchased from the Gable Nursery. In their opinion, and evidently unaware of Moul's paper, the introduction of the species into North America was unresolved.

In light of the available data, it seems likely that P. perfoliatum was introduced into North America at several localities in the United States as a weed seed, becoming established only in the Gable Nursery in Pennsylvania. Widespread and common in eastern Asia (Kasahara, 1954; Steward, 1930), seed of the species could likely be introduced with seed

of similar size, as Ilex species (Bailey, 1949), imported from Asia. It also seems apparent that dispersal of the plant by Rhododendron hybrids sold by the Gable Nursery is insignificant. Dispersal of the plant from the nursery infestation into the Pennsylvania countryside may be attributable to birds and to water along streams (where Hickman and Hickman first encountered the plant).

Polygonum perfoliatum is commonly encountered in floodplains or along stream edges where seed has been brought by water. Ohwi (1965), and Backer and Van Den Brink (1963) list the Asian habitat of the species as water-sides and wet thickets. Ridley (1930) states that important adaptations for dispersal by water include persistent and accrescent sepals, and extended buoyancy potential. It seems that the sepals of the species, baccate after anthesis, form a buoyant, berry-like fruit that is well adapted for long-distance dispersal by water. The rapid, southern spread of the plant may be principally attributed to water dispersal. The plant has spread from southeastern Pennsylvania via the numerous water systems draining the region. The Deer Creek and Gunpowder River systems are the primary dispersal routes by which the plant invaded Maryland. Subsequent dispersal has followed these systems, and adjacent drainage basins (Fig. 1) via stream capture to include the Susquehanna, and the Monocacy and Patapsco Rivers, to the east and west respectively, and the Patuxent River into southern Maryland. Rapidly spreading seed will likely be carried to the Potomac River via the Anacostia River, or by the Monocacy and Patuxent Rivers, and thus into Virginia to be dispersed by similar drainage patterns therein. The plant has also entered the estuaries of the upper Chesapeake Bay where it flourishes along beaches and marsh strands. It will be interesting to note the extent to which it is carried by tides to the Eastern Shore of Maryland as well as intolerance, if any, to increasing saline conditions.

Polygonum perfoliatum is also making dramatic invasions into upland habitats. It appears that upland dispersal is most likely attributable to birds. Generally, the prickly foliage of the species has not attracted foraging herbivores, whereas the easily accessible and abundant fruits have been observed to be ingested by birds. The fruits are adapted for dispersal by birds based on criteria for bird dissemination by Ridley (1930) and Dorst (1974). They are small and are sufficiently bright and conspicuously colored to be attractive from a distance. Dispersal by birds has, perhaps, effected the unusually rapid spread of this exotic species in the Mid-Atlantic region. Indeed, a relationship has developed that scatters the species to the east or west across geologic drainage barriers. Hence, the species can be expected in Delaware and West Virginia in future years.



Presently eradication programs have not been initiated in Pennsylvania or Maryland to control the spread of this noxious pest. It seems that the plant has become so well established, that hope of ever completely wiping it out has passed. Potentially useful herbicides for local control are Roundup (Glyphosate), for non-selective eradication, and Banvel (Dicamba), which selectively kills Polygonum species.

COLLECTION DATA

MARYLAND-ANNE ARUNDEL CO.: Banks of the Patapsco River near Rt. 695 bridge, 9-5-78, Riefner 78-166; thickets along South River near Rt. 50, 8-2-80, Riefner 80-296; low ground and thickets along Rt. 3 W of St. Stephens Church Rd., 10-9-81, Riefner 81-736; disturbed areas along roadsides and creek floodplain on Rt. 170 near Rt. 295, 10-9-81, Riefner 81-737; in honeysuckle along Rt. 295, 10-9-81, Riefner 81-738.

BALTIMORE CITY: Overtaking planting of Coronilla varia on shoulder of Rt. 83 near Northern Parkway, 10-9-81, Riefner 81-730; wayside of Coldspring La. W of Rt. 83, 10-9-81, Riefner 81-731; thickets and gullies along Jones Falls Creek near southern city limit, Mt. Washington, 10-9-81, Riefner 81-732; thickets along Rt. 83 near city limit, Mt. Washington, 10-9-81, Riefner 81-735.

BALTIMORE CO.: Shrub swamp along Falls Rd. near Big Gunpowder River, 7-2-76, Riefner 76-10; high climbing vines in Robinia-Lonicera waste place along Evna Rd. powerline right-of-way, 7-8-76, Riefner 76-26; field edge among Rubus thickets, Falls Rd. at Parkton, 7-12-76, Riefner 76-31; wooded floodplain with P. sagittatum and P. arifolium along the Little Gunpowder River at Harford Rd. crossing, 9-12-76, Riefner 76-436; woodland borders at the Loch Raven Dam, 9-20-76, Riefner 76-440; thickets edge of powerline right-of-way E from Loch Raven Dr. along Cromwell Bdg. Rd., 9-20-76, Riefner 76-440a; rambling along sandy depressions and gullies along Harford Rd. at Factory Rd., 9-21-76, Riefner 76-448; roadsides and woodland margins over Rubus-Lonicera thickets along Notch Cliff Rd., 9-22-76, Riefner 76-452; extensive growth in floodplain along Big Gunpowder Falls near Big Falls Rd., 4-13-77, Riefner 77-88; along banks of Little Falls near Graystone Rd., 7-16-77, Riefner 77-677; extensive growth in alluvial Juglans bottomland near Big Gunpowder Falls and Bunker Hill Rd., 8-29-77, Riefner 77-794; along creek at Upper Beckley Rd., 9-5-77, Riefner 77-802; roadsides of Martin Blvd. near Eastern Ave., 6-3-79, Riefner 79-147; low ground along Grace's Quater Rd., 6-29-70, Riefner 79-232; beaches at Hammerman Area of Gunpowder Park, 6-29-79, Riefner 79-245; low ground at Dundee Creek, 8-4-79, Riefner 79-306; wayside Rt. 95 near White Marsh, 6-28-80, Riefner 79-306; wayside Rt. 132 near Green Spring Rd.

exit, 7-4-80, Riefner 80-174; along Rt. 695 at York Rd. exit, 7-4-80, Riefner 80-185; along stream floodplain and thickets at Bonita Rd., Owings Mills, 8-9-80, Riefner 80-334; along Rt. 1, Rubus thickets, Kingsville, 9-5-80, Riefner 80-369; thickets along Rt. 83, Ruxton, 10-18-80, Riefner 81-800; in hedges along Stevenson La., 10-18-81, Riefner 81-802; thickets along Liberty Reservoir at Nicodemus Rd., 10-18-81, Riefner 81-803; eroded banks at Bare Hills, 10-18-81, Riefner 81-805; extensive colony along Reistertown Rd. near Rt. 695, 10-20-81, Riefner 81-806; along Rt. 25 at Butler, 10-20-81, Riefner 81-807.

CALVERT CO.: Floodplain along the Patuxent River, near Lyons Creek, 10-9-81, Riefner 81-739.

CARROLL CO.: Edge of pond at Backwoods Rd. and Deep Run, 8-1-78, Riefner 81-144; along Pipe Creek near Rt. 27, Manchester, 8-1-78, Riefner 78-145; along banks of Silver Run and along Rt. 140, 8-27-79, Riefner 79-354; along Rt. 84 near Uniontown, overtaking Lonicera, 10-2-79, Riefner 79-557; along Middle Run near Rt. 91, 9-5-80, Riefner 80-360; banks of South Branch Patapsco River, Sykesville, 9-5-80, Riefner 80-362; along Rt. 26 at Eldersburg, 10-11-81, Riefner 81-755; Rt. 26 at Uniontown, 10-11-81, Riefner 81-756; along Liberty Lake Reservoir near Nicodemus Rd., 10-18-81, Riefner 81-808.

CECIL CO.: Wet thickets along the Susquehanna River, Port Deposit, 10-7-77, Riefner 77-856; dithes with Microstegium vimineum and woodland thickets N along the Susquehanna River ca. 1 mi. from Rt. 1 crossing, 8-22-80, Riefner 80-367; along Rt. 95 near rest station E of Susquehanna River, 10-18-81, Riefner 81-809.

CHARLES CO.: Weak plant along Patuxent River wash, Benedict, 10-9-81, Riefner 81-740.

FREDERICK CO.: Stream Floodplain and thickets along Rt. 70 near Rt. 75 crossing, 8-9-80, Riefner 80-323.

HARFORD CO.: Sandy river wash along Deer Creek downstream from Telegraph Rd., 7-20-75, Riefner 75-101; roadside Rt. 1 near Susquehanna River, 10-7-77, Riefner 77-855; along Deer Creek near the Rocks Park, 9-5-81, Riefner 78-165; extensive growth around old beaver pond near Eden Mill Rd., 6-18-79, Riefner 79-194; weak plants in mesic woods along the Little Gunpowder River and sandy riverwash E from Rt. 1, 7-20-80, Riefner 80-249; wayside thickets of Rt. 1 N of Little Gunpowder River, 8-18-80, Riefner 80-358; thickets along Old Joppa Rd., 8-22-80, Riefner 80-360; along stream banks near Lake Fanny Rd., 8-22-80, Riefner 80-364; woodland margins of Sandy Hook Rd., 10-4-80, Riefner 80-499; roadside thickets along Shures Ldg. Rd., 10-4-80, Riefner 80-502; banks of Little Gunpowder River near Green Rd., 10-5-80, Riefner 80-513.

HOWARD CO.: Low ground along Patapsco River on properties of Calvert Distilleries, 7-7-78, Riefner 78-137; sandy wash of Patapsco River near Rt. 40, 10-2-79, Riefner 79-550; along Rt. 70 near Howard Co. Fair-grounds, 7-13-80, Riefner 80-231; thickets at Triadelphia Reservoir, 8-9-80, Riefner 80-312; thickets at Rocky Gorge Reservoir, 8-9-80, Riefner 80-319.

MONTGOMERY CO.: Thickets at Triadelphia Reservoir, 8-9-80, Riefner 80-324; low ground at Rocky Gorge Reservoir, 8-9-80, Riefner 80-325; along Rt. 193 at Wheaton, 10-15-81, Riefner 81-789.

PRINCE GEORGES CO.: In shrubs, NW side of Health Center along roadside, Univ. Md. at College Park, 7-17-80, Hill 9343; along Rt. 301 near Queen Anne Rd., 10-13-81, Riefner 81-780; thickets along Rt. 301 near Peerless Ave., 10-15-81, Riefner 81-781; thickets along Rt. 95 near Rt. 495 junction, 10-15-81, Riefner 81-785; disturbed ground at U.S.D.A. complex, Beltsville, 10-15-81, Riefner 81-786; along Rt. 295 near Bladensburg, 10-15-81, Riefner 81-788.

WASHINGTON D.C. Low ground Polygonum sagittatum thickets, S of Rt. 295 along Anacostia River, 10-25-81, Riefner 81-815.

Voucher specimens have been deposited at the University of Maryland at College Park (MARY).

ACKNOWLEDGEMENTS

I would like to express my appreciation to Drs. Steven Hill and Allen Skorepa for their helpful comments; Dr. Ronald Ridder for his recommendations of potentially useful herbicides, and Dr. David Lee of the North Carolina State Museum for permission to use the Maryland map.

LITERATURE CITED

- Abrams, Leroy, 1944. Illustrated flora of the Pacific States. Stanford University Press.
- Backer, C.A. And Bakhuizen Van Den Brink, Jr. 1963. Flora of Java, Vol. 1, N.V.P. Noordhoff-Groningen, The Netherlands.
- Bailey, L.H. 1949. Manual of cultivated plants. MacMillan Co., New York, New York.

- Dorst, J. 1974. The life of birds, Vol. 1. Columbia University Press New York, New York.
- Hickman, J.C. and C.S. Hickman. 1978. Polygonum perfoliatum: A recent Asiatic adventive. *Bartonia* 45:18-23.
- Hitchcock, Leo C., A. Cronquist, M. Ownbey, J.W. Thompson. 1964. Vascular plants of the Pacific Northwest. University of Washington Press.
- Kasahara, Y. 1954. Studies on the weeds of arable land in Japan, with special reference to kinds of harmful weeds, their geographic distribution, abundance, life-length, origin and history. *Ber. Ohara Inst.* 10 (2): 72-109.
- Moul, E.T. 1948. A dangerous weedy Polygonum in Pennsylvania. *Rhodora* 50: 64-66.
- Munz, P.A. 1968. A California flora. Cambridge University Press; University of California Press.
- Ohwi, Jisaburo. 1965. Flora of Japan. Smithsonian Institution, Washington D.C.
- Ridley, H.R. 1930. The dispersal of plants throughout the world. L. Reeve and Co.
- Riefner, R.E., Jr. and D.R. Windler. 1979. Polygonum perfoliatum L. established in Maryland. *Castanea* 44: 91-93.
- Reed, C.F. 1977. Economically important foreign weeds, potential problems in the United States. U.S.D.A. Agri Handb. No. 498.
- Reed, C.F. 1979. Tracaulon perfoliatum (L.) Greene in Maryland. *Phytologia* 43: 219-221.
- Reed, C.F. 1979. Additional notes regarding Tracaulon perfoliata (L.) Greene. *Phytologia* 43: 293.
- Steward, A.N. 1930. The Polygoneae of Eastern Asia. *Contrib. Gray Herb.*, No. LXXXVIII.